Role of echocardiography in evaluation of congenital coronary artery fistular in children

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General Note
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ABSTRACT

Objective: Comparison of the similarities between echocardiography and coronary artery catheterization in subjects with congenital coronary artery fistular. Methods: The study of describing a series of 20 cases of coronary artery fistular diagnosed by echocardiography, coronary catheterization, and intervention of coronary artery fistular blockage by cutaneous at Children’s Hospital 2, Ho Chi Minh City from 4/2010 – 9/2019. Results: There was no similarity in the diagnosis of the number of holes in coronary artery fistular for both echocardiography and cardiac catheterization (p<0.05). Echocardiography and cardiac catheterization have similar findings on parameters of coronary artery fistular, fistulous location, coronary artery size, aneurysm size, and PAPs in patients with congenital coronary artery fistular. Conclusion: Echocardiography and coronary angiography have similar findings on coronary arterial parameters; fistular track location, coronary artery size, aneurysm size, and PAPs in patients with congenital coronary artery fistular.

Keywords: echocardiography, cardiac catheterization, congenital coronary artery fistular.
1. INTRODUCTION

Coronary artery fistula is a rare anomaly of the cardiovascular system, defined as an abnormal connection between a coronary artery and a cardiac chamber or vessel. Coronary artery fistula is estimated to comprise 0.2–0.4% of all congenital heart disease cases. Coronary artery fistula is a condition in which the coronary artery is connected to the heart chamber or into large blood vessels near the heart, such as the coronary sinuses, pulmonary artery, or superior vena cava without entering the coronary capillary bed of the heart muscle. The causes of coronary artery fistula are mostly congenital, a very rare number acquired after cardiac surgery, trauma, after pacemaker, cardiac muscle biopsy, or after coronary angiography (Lim et al., 2014; Reddy et al., 2015). Pectoral echocardiography is a non-invasive means to see large dilated coronary arteries, zigzag paths, locate the heart chamber or large blood vessels in the heart, regional movement disorders, and mind function. Left ventricular collection, pulmonary artery pressure, and other associated abnormalities. Prenatal echocardiography can detect disease. Coronary angiography is the gold standard for diagnosing this disease (Valente et al., 2010; Xie et al., 2014). On the coronary artery catheterization, you can see the origin, shape, size, aneurism, coronary path, location, and the number of probes. The coronary artery catheterization is both a diagnostic method and a treatment for coronary artery disease, but currently, there are not many studies in our country to evaluate the value of cardiac catheterization in diagnosis.

2. MATERIALS AND METHODS


All patients with coronary artery fistula bypass coronary artery catheterization diagnosed and / or intervened, meeting the sample selection criteria.

Study design
The study describes a series of cases.

Echocardiography
- coronary artery fistula;
- Coronary heart chambers detectors;
- Dimension of coroners;
- Coronary Z score;
- Aneurysm size;
- Number of detection holes;
- Probe hole diameter;
- Pulmonary artery pressure;
- Dilated heart chamber;
- Detect residual after blocked the vents (Figure 1).

![Figure 1](image.png)

**Figure 1** Echocardiography of a 3-year-old male patient with coronary artery fistular
Figure 2 Coronary angiography of a 2-year-old male patient with coronary artery fistular.

Data processing method

Collected data were processed and processed using SPSS 22.0 biomedical statistical software.

3. RESULTS

The results were similar when diagnosing coronary artery fistular, in which right coronary artery fistular were more than left coronary artery fistular (60% versus 40%). The study noted the similarity in the diagnosis of coronary artery fistular location of both echocardiography and coronary angiography (p > 0.05) (Table 1). The study noted that there was no similarity in the diagnosis of the number of holes in coronary artery fistular for both echocardiography and coronary angiography (p<0.05). When the echocardiogram did not detect the number of holes in coronary artery fistular (35%), the number of holes in the diagnostic catheter could still be detected (Table 2).

Table 1 Congenital coronary artery fistular on echocardiography and coronary angiography

<table>
<thead>
<tr>
<th>Echocardiography</th>
<th>Coronary angiography</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary artery fistular (R)</td>
<td>N (%)</td>
<td>Coronary artery fistular (L)</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>12(60.0)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Coronary artery fistular (L)</td>
<td>N (%)</td>
<td></td>
</tr>
<tr>
<td>0(0.0)</td>
<td>8(40.0)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Cardiac catheterization and coronary angiography in the number of holes in coronary artery fistular in a patient with congenital coronary artery fistular

<table>
<thead>
<tr>
<th>Echocardiography n (%)</th>
<th>Coronary angiography (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not examined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One hole in coronary artery fistular</td>
<td>2 (28.5)</td>
<td>4(57.1)</td>
</tr>
<tr>
<td>Two holes in coronary artery fistular</td>
<td>0(0.0)</td>
<td>11(100)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>&lt;0.05</td>
<td></td>
</tr>
</tbody>
</table>
The study noted the similarity in the diagnosis of the location of coronary artery fistular for both echocardiography and coronary angiography (p > 0.05). Both echocardiography and coronary angiography recorded the same coronary artery fistular, the majority being ventricular (R) (75%), (Table 3). Table 4 shows the similarity between echocardiography and coronary angiography about the measurement of coronary artery size, aneurysm, and PAPs in patients with congenital coronary artery fistular.

### Table 3
The similarity between echocardiography and coronary angiography in the location of the transfusion pathway in patients with congenital coronary artery fistular

<table>
<thead>
<tr>
<th>Echocardiography n (%)</th>
<th>Coronary angiography n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right atrium</td>
</tr>
<tr>
<td>Right atrium</td>
<td>3(100)</td>
</tr>
<tr>
<td>Right ventricle</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Left atrium</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Pulmonary artery</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Total</td>
<td>3(15.0)</td>
</tr>
<tr>
<td>p</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

### Table 4
The similarity between echocardiography and coronary angiography about the measurement of coronary artery size, aneurysm, and PAPs in patients with congenital coronary artery fistular

<table>
<thead>
<tr>
<th></th>
<th>Echocardiography</th>
<th>Cardiac catheterization and coronary angiography</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary artery fistular size (R)(mm)</td>
<td>5.04 ± 2.28</td>
<td>4.81 ± 1.57</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Coronary artery fistular size (L)(mm)</td>
<td>4.28 ± 1.93</td>
<td>4.09 ± 1.94</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Coronary artery aneurysm size(mm)</td>
<td>-</td>
<td>8.73 ± 6.28</td>
<td></td>
</tr>
<tr>
<td>PAPs (mmHg)</td>
<td>35.22 ± 15.34</td>
<td>30.71 ± 11.30</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

### 4. DISCUSSION
In our study, when comparing echocardiography and coronary angiography in the diagnosis of coronary artery disease, we found similar results when diagnosing coronary artery fistular. In terms of left and right coronary artery size when the echocardiography and coronary angiography are similar, the echocardiography recorded coronary artery (R) is 5.04 ± 2.28 mm, coronary artery (L) is 4.28 ± 1.93 mm. There were recorded differences in determining the number of holes in coronary artery fistular between echocardiography and coronary angiography (with p <0.05), in particular, there were 07 cases (35%) of non-observable echocardiography the number holes in coronary artery fistular. In comparison, only 02 cases of cardiac catheterization and coronary angiography did not specify the number of holes in coronary artery fistular.

Both echocardiography and coronary angiography recorded the same coronary artery fistular location, the majority being ventricular (R) (75%). According to research by Huynh Thanh Kieu, coronary artery fistular originating from coronary arteries must be dominant (53.8%) (Kieu, 2017). The study by Pham Thu Linh, right coronary artery fistular accounted for 81%, fistular from coronary artery was 19%. Cardiac catheterization and coronary angiography recorded an average coronary aneurysm size of 8.73 ± 6.28 mm (Linh and Vinh, 2003). Our research results are similar to some domestic and foreign studies (Kieu, 2017; Aggarwal et al., 2018; Herbert et al., 2019). Echocardiography diagnoses the disease with a high degree of accuracy in diagnosing coronary arteries fistulas, the location of the fistular line, coronary artery size. Echocardiography is, therefore, a readily available, non-invasive means that can be performed multiple times to diagnose and monitor disease progression.

### 5. CONCLUSION
There was no similarity in the diagnosis of the number of coronary artery fistulas for both echocardiography and cardiac catheterization (p <0.05). Echocardiography and coronary angiography have similar findings on coronary arterial parameters; fistular track location, coronary artery size, aneurysm size, and PAPs in patients with congenital coronary artery fistular.
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Conflicts of Interest: The authors declare no conflict of interest.

Informed consent
Informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval for study protocol
The study was approved by the Medical Ethics Committee of Children Hospital 2 (ethical approval code: 012010-CH2).

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